Operation Ruby Throat: The Hummingbird Project Protocol

Purpose

To observe seasonal migration patterns, feeding habits, and nesting behavior of Ruby-throated Hummingbirds *(Archilochus colubris)* in North and Central America

Overview

Students in the U.S. and Canada collect data for one or more of the following special measurements for Ruby-throated Humming birds (RTHUs):

- Observe first Spring sighting of migrant RTHU.
- Make daily observations.
- Record RTHU sightings throughout hummingbird season (Spring through Autumn).
- Observe final departure date of RTHU migrant in Autumn.
- Count number of RTHU visits to hummingbird feeders and/or to flowers, or compare bird feeder versus flower visits.
- Identify different species of flowers in a hanging basket, flower basket, garden, or natural area and count number of RTHU visits to those species.
- Observe nesting behavior.
- Report "unusual" hummingbirds that are color-marked, have abnormal plumage, or that occur out of normal range.

Students in Mexico and Central America collect data similar data to the above except:

- First sightings of returning RTHU are in Autumn.
- Final departure date is in Spring.
- Nesting behavior does not occur in the tropics.

Student Outcomes

All students will learn about hummingbird natural history and ecology. Students will learn how to identify and age male and female Ruby-throated Hummingbirds and to observe migration and feeding behavior. Students will learn how to make connections among hummingbird behavior and weather, climate, food availability, seasonality, photoperiod (day length), and other environmental factors.

Science Concepts

Life Sciences

Organisms can only survive in environments where their needs are met.

Plants and animals have life cycles.

Some animals, through migration, spend parts of their life cycles in different ecosystems.

Reproduction is a characteristic of all living organisms.

Functions of an organism relate to and change the nature of its environment.

Interaction among organisms in an ecosystem results in adaptive change in organisms over time.

All organisms must be able to obtain and use resources while living in a constantly changing environment.

All populations living together and the physical factors with which they interact constitute an "ecosystem".

Organisms both cooperate and compete in ecosystems.

Organisms living together and the physical factors with which they interact constitute an ecosystem.

Geography

How to use maps (real and imaginary).

The physical characteristics of place.

The characteristics and spatial distribution of ecosystems.

How human modify the physical environment.

Science Inquiry Abilities

Identify, age, and sex Ruby-throated Hummingbirds (RTHUs).

Count living, moving hummingbirds.

Identify flower species.

Plant and care for Hummingbird Habitats (optional).

Identify answerable questions.

Design and conduct scientific investigations.

Use appropriate math to analyze data.

Develop descriptions and explanations using evidence.

Recognize and analyze alternate explanations.

Communicate procedures and explanations.

Time

Sightings: Any time during day

Bird feeder and Flower Visits: 45 minutes at same time of day

Flower Species Visits: 45 minutes minimum at same time of day (if possible make observations for several consecutive hours)

Frequency

First Spring Sighting: Daily for three weeks (beginning approximately mid-March in southern U.S., later in northern U.S. and Canada)

Last Spring Sighting (Mexico and Central America): Specific time frame not known; approximately 1 February through Mid-March

Sightings Through Seasons: Daily preferred

Bird feeder and Flower Visits: At least two times each week (daily, if possible, from approximately 1 April to 1 October in the U.S. and Canada, remainder of the year in the tropics)

Last Autumn Sighting: Daily (preferred) for three weeks (approximately late September until mid-October)

First Autumn Sighting (Mexico and Central America): Specific time frame not known; approximately mid-August through mid-October

Nesting behavior: Daily if a nest is found (approximately mid-April through early August; nesting occurs only in U.S. and Canada)

"Unusual" hummingbirds: When sighted

Level

All

Materials and Tools

Hummingbird Data Sheets

GPS Data Sheet

GPS Field Guide

Calculator (optional)

Camera

Hummingbird feeder and food (optional if hummingbird flowers are used)

Hummingbird flowers (optional if hummingbird feeder is used)

Clipboard

Pencils and pens

Binoculars (optional)

Bird identification guide

Wildflower identification guide (optional)

Cultivated flower identification guide (optional)

GPS receiver (may be borrowed)

Compass

Preparation

Learn how to identify male, female, and immature Ruby-throated Hummingbirds, using bird identification guides and information on the Web site for Operation *RubyThroat: The Hummingbird Project at* www.rubythroat.org.

Prerequisites

None

The Hummingbird Project Protocol – Introduction

Have you ever noticed those colorful little birds that fly around flowers in gardens or meadows? They seem to never stop, moving from one flower to the next; they almost look like very large insects. These tiny birds are hummingbirds—fascinating creatures that are common in many areas but about which there is much to learn. When do they migrate in the Spring and Autumn? How do storms affect their migration? Can you imagine how a strong wind might blow these miniature light-weight creatures away from their intended path? Do they even—*have*—an intended path?

Scientists want to learn about their migration patterns as well as their eating and nesting behavior. What flowers do they prefer to visit for sweet nectar? Will they come to a hummingbird feeder in your schoolyard? How do adult hummingbirds care for their eggs and young hummingbirds after they hatch? One commonly seen hummingbird is the Ruby-throated Hummingbird. Does behavior within this bird's nesting range in Canada and the United States differ from that on its wintering grounds in Mexico and the seven countries of Central America? Your observations may help answer these kinds of questions and greatly help scientists while you enjoy studying hummingbirds and their habits.

When you observe hummingbirds you are also helping scientists to better understand how animals may be responding to weather and longer term climate change. Hummingbird migration, nesting, and eating behavior are affected by temperature, precipitation, land cover, and many other things. Taking other GLOBE measurements along with hummingbird observations will lead to interesting projects and important science findings in which you can be an important participant.

Have fun while learning about hummingbirds and the natural world around you!

Background

The Ruby-throated Hummingbird (*Archilochus colubris*) is an ideal species for a cross-disciplinary science study involving students from Canada, Mexico, the United States, and all seven Central American countries (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama). Known in Spanish as *mansoncito garganta de fuego* or *chupaflor rubi*, rubythroats are the most widely distributed of all hummingbirds. They come readily to artificial feeders and are tolerant of humans. Ruby-throated Hummingbirds are fascinating creatures that immediately capture a student's imagination and lead him or her into scientific investigation and discovery. Information and photos about RTHU biology, behavior, and ecology can be found on the web site for Operation *RubyThroat: The Hummingbird Project* at www.rubythroat.org.

Ruby-throated Hummingbirds (RTHUs) are Neotropical migrant insect- and nectar-eaters that range from Central America to Alberta, Canada and from the east coast of the United States to the middle of the Great Plains. They breed in the eastern U.S. and southern Canada and winter over from Mexico south to the Panama Canal (occasionally in southern Florida and along the U.S. Gulf Coast and very rarely elsewhere in the continental U.S.). Figure EA-RT-1 shows the species' distribution. Scientists do not know exactly how far north RTHUs breed, so Canadian students who live near the northern edge of the map's red area can provide important information about the species' actual range.

RTHUs also occur rarely during the non-breeding season in parts of the Caribbean Region; there has been at least one report from each of the following islands: Bahamas, Bermuda, Cayman Islands, Cuba, Dominican Republic, Haiti, Jamaica, and Puerto Rico. Schools at these locations are encouraged to participate in Operation RubyThroat, with the understanding that hummingbirds they see likely will not be RTHUs. Nonetheless, if Caribbean students are alert for RTHUs, there is a possibility they will see one and contribute significantly to our understanding of RTHU winter ranges. Ornithologists are always alert for possible range

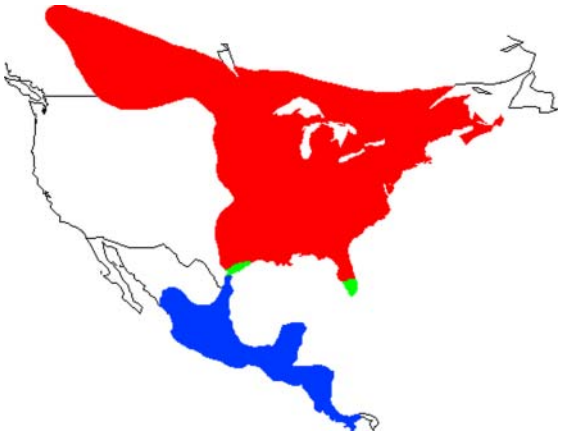
extensions, especially during times of environmental change.

Migration and overwintering patterns in RTHUs are poorly understood. Some experts speculate that RTHUs follow similar routes for both northward and southward migrations, with some birds flying non-stop across the Gulf of Mexico and others going overland through Mexico. In some years, RTHUs appear to move northward at approximately the same rate as the 1.7 degree C isotherm, which may correlate with availability of small insects and flowering times of several temperate plant species that provide energy-rich nectar.

RTHU migration details remain a mystery. We do not know specifically where populations from various parts of North America overwinter since no one in Mexico or Central America has reported a RTHU banded in the U.S. or anywhere in the tropics. In fact, only about a dozen of the more than 50,000 RTHUs banded in the U.S. and Canada have been recaptured or found dead and reported from sites within the continental U.S.

The first RTHU ever recaptured more than 15 kilometers away from its banding site was a young male banded and color-marked in late September 1991 at Hilton Pond Center for Piedmont Natural History near York, South Carolina, and re-trapped 10 days later near Atlanta, Georgia. Color-marked birds from Hilton Pond also have been seen or retrapped in Mobile, Alabama, and in Cameron, Louisiana.

Figure EA-RT-1: Distribution of the Ruby-throated Hummingbird (Archilochus colubris). RED—Breeding Range; BLUE—Winter Range; GREEN—Year-round Range



It is not clear what triggers the onset of RTHU migration toward the north in Spring and back south in Autumn; photoperiod (length of day) appears to be a major factor. We do not understand the effects of local or regional weather and there are no scientifically useful data about the actual impact of tropical storms and hurricanes on the trans-Gulf Autumn migration of RTHUs. Winds may influence Spring migration to the breeding grounds, but no one has explored this possibility. Likewise, no one has studied extensively how RTHU migration movements may be affected by the end of flower production or by land cover changes in the tropics or North America.

Some participants in the U.S. or Canada will be fortunate enough to find an active RTHU nest. If this happens, students may conduct an in-depth observation of nesting behavior. Be careful not to disturb the nest and please do not report an old or abandoned nest where no activity is seen. Although RTHUs have the widest breeding distribution of any of the 338 hummingbird species, there is still much to be learned about their nesting behavior. Males are not believed to build nests, incubate eggs, or care for nestlings, so any observation of adult male activity near the nest is potentially important. Female RTHUs have been known to lay a second or third clutch of eggs in one breeding season, but it is not clear whether this behavior occurs regularly or because an earlier nest fails from predation or other interference. Little is known about the relationship between re-nesting, weather, and altitude or geographic latitude.

Very little is known about RTHU behavior on the wintering grounds, including what plants the birds use for nectar, whether they defend feeding territories, or how they interact with the many other hummingbird species that are permanent residents in the tropics. Schools in Mexico and Central America can make significant contributions to the understanding of RTHU behavior just after the birds arrive in Autumn migration, during the months RTHUs are on their non-breeding grounds, and just prior to when RTHUs depart for their trip north.

Although most hummingbirds observed in the eastern half of the U.S. will be "normal" RTHUs,

students may encounter "unusual" hummingbirds. These include:

1. RTHUs with abnormal pigmentation, especially albinos, partial albinos, and leucistic individuals (detailed descriptions in the next section);
2. RTHUs that have been color-marked with dye or paint as a way to study their migration patterns; or,
3. Vagrant western, Mexican, or Caribbean hummingbird species other than RTHUs that wander into the eastern U.S. and Canada, particularly in Autumn and Winter.

It is important to record sightings of these "unusual" hummingbirds on GLOBE *Data Sheets* and to immediately report the sightings to research@hiltonpond.org or (803) 684- 5852. If possible, please take photographs. Photos and descriptions of some of these "unusual" hummingbirds follow the section below that describes typical RTHUs.

Ruby-throated Hummingbird (RTHU) Identification

Common Characteristics

All RTHUs have backs, foreheads, wings, and tails that are dark iridescent green. Adult male RTHUs (Figure EA-RT-2) have iridescent red coloring on the throat, called a "gorget", while adult females typically have white throats (Figure EA-RT-3); this makes it easy to determine a bird's sex in Spring when only adult birds are present. Although very rare, an adult female will show light streaking on her throat in early Spring; however, she is still easily differentiated from the adult male with his red throat. Sometimes in dim light the iridescent red and green appear black or brown, so it is important to try to make observations under good lighting conditions.

Newly hatched male and female RTHUs do not have red on their throats; they both resemble adult females, making it difficult to determine sex or age among white-throated birds during late Spring, Summer and Autumn. However, young males sometimes have throats streaked with green or black and some even acquire a few red throat feathers prior to Autumn migration (Figures EA-RT-4 and EA-RT-5).

Young males and females of any age have white tips to their outer tail feathers. RTHU males of any age are typically up to 25% smaller than females, but size should not be used as a factor when sexing hummingbirds. Please visit www.rubythroat.org/RTHUExternalMain.html for more hints on determining sex in RTHUs.

RTHUs undergo feather molt on the wintering grounds in Mexico and Central America. Prior to Spring migration, young males hatched during the preceding breeding season develop a full red gorget. They, as well as adult males and females of any age, replace all wing, tail, and body feathers. Female RTHUs resemble females of several other hummingbird species that occur in the tropics, so it is very difficult to make positive identifications of them during Winter in Mexico and Central America; adult male RTHUs can be identified more easily. Please be cautious in reporting that hummingbirds observed in winter in the tropics are RTHUs.

RTHUs with unusual plumage

RTHUs sometimes exhibit color patterns that are very different from their normal green, white, and red. Albino RTHUs are very rare and are completely white with pink eyes, bill, and feet. Occasionally there are also "leucistic" forms that have normal black eyes, bill, and feet (Figure EA-RT- 6), but in which some or all the feathers are white, gray, or otherwise abnormally colored. (Figure EA-RT-7). Nothing is known about the behavior of albinistic or leucistic RTHUS during Autumn migration or on the wintering grounds. Curiously, none of these birds that have been banded in the U.S. have ever returned in a later year. It is not known whether these abnormally colored birds die in migration or are simply unable to compete with other hummingbirds in the tropics. Visit www.rubythroat.org/AlbinoMain.html for more information about hummingbirds with unusual coloration.

Color-marked RTHUs

As part of *Operation RubyThroat: The Hummingbird Project,* RTHUs captured and banded at Hilton Pond Center for Piedmont Natural History near York, South Carolina, are color-marked with temporary green dye on the upper breast or throat (Figure EA-RT-8). Birds banded at other locales through *Operation* RubyThroat may be marked with other dye colors. A few hummingbird banders working on other projects use different color-marking schemes, including the placement of a bright paint dot on the top of the bird's head. RTHUs sometimes accumulate large amounts of yellow, orange, or white pollen on their heads, throats, and upper breasts; these deposits should not be confused with color-marking.

If possible, take a photo of any color-marked hummingbird and try to determine whether it is banded on the left or right leg. Accurate sightings of these color-marked birds are very valuable in helping us understand Spring and Autumn migration patterns of RTHUs even if the bird is not recaptured by a licensed hummingbird bander in your area. Students in Mexico and Central America should be especially vigilant for color-marked RTHUs, since a RTHU banded and marked in the U.S. or Canada has never been reported from the tropics. For more details about the color-marking project, refer to www.rubythroat.org/NewsRFIColormark00Sp.html.

Winter Vagrant Hummingbirds: United States and Canada

RTHUs are the only hummingbirds that regularly breed in the region shown in red in Figure EA-RT-1; this includes 38 states east of the Rocky Mountains, plus the District of Columbia and southern and eastern Canada. Nonetheless, several western U.S., Mexican, and Caribbean hummingbird species have been known to wander eastward, especially during Autumn migration, and a few vagrant hummingbirds winter over each year in the eastern U.S. At least ten species of hummingbirds from the western U.S. have been verified east of the Rocky Mountains during Winter.

In the eastern U.S. the most likely Autumn and Winter vagrants are Rufous Hummingbirds (see Figures EA-RT-9 through EA-RT-12). Other possible species include, but are not limited to: Anna's Hummingbird, Black-chinned Hummingbird, Blue-throated Hummingbird,

Broad-billed Hummingbird, Broad-tailed Hummingbird, Buff-bellied Hummingbird, Calliope Hummingbird, Green Violet-ear, and Magnificent Hummingbird. Adult males of these species cannot be confused with adult male RTHUs, but young males and females sometimes cannot be identified to species unless captured, measured, and examined closely by a licensed hummingbird bander. Observers in states along the Gulf of Mexico may see unusual hummingbirds that wander in from Mexico or the Caribbean.

If you are in the eastern U.S. or Canada and sight a species other than a RTHU at any time of year—or if you see **ANY hummingbird in that region from 15 October through 15 March—**please contact Hilton Pond Center for Piedmont Natural History at research@hiltonpond.org or (803)684-5852. It is important to report these vagrant birds immediately because they often stay in an area few only a few days and then move on to another site. Also record your observations on your Hummingbird *Data Sheets* and take photos of the hummingbird if possible; be sure to include notes about the bird's color and other markings.

For photographs and descriptions of some other hummingbird species that may occur in your study area, see www.rubythroat.org OtherSpeciesMain.html, and refer to www.rubythroat.orgResearchHummerVagrantMain.html)

Figure EA-RT-2a: Adult male Ruby-throated Hummingbird, with full red gorget

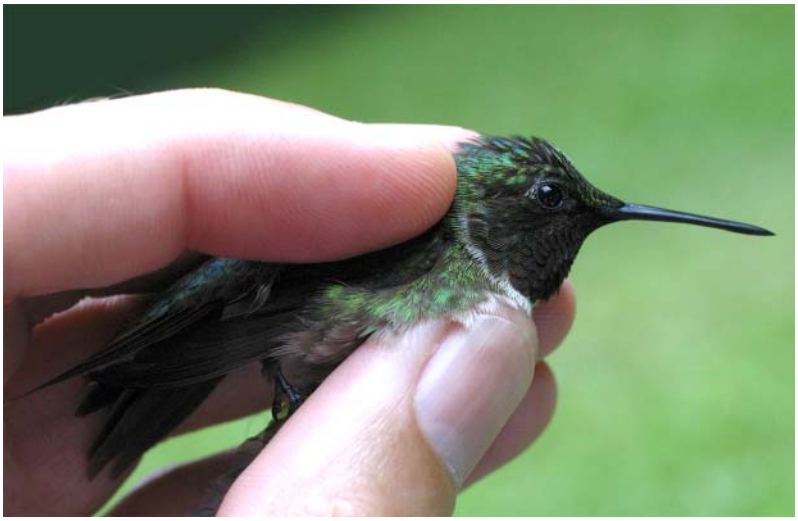


Figure EA-RT-2b: The red gorget of the adult male Ruby-throated Hummingbird appears black when viewed from the side or in poor light.

Figure EA-RT-3: Adult female Ruby-throated Hummingbird, with unmarked white gorget (Young female RTHUs and most young males also have unstreaked white throats.)

Figure EA-RT-4: Young male Ruby-throated Hummingbird, with throat streaking.

Figure EA-RT-5: Young male Ruby-throated Hummingbird, with few red gorget feathers and throat streaking.

Figure EA-RT-6: Heavily leucistic Ruby-throated Hummingbird, with white feathers, black bill, and black eyes. True albinos have white plumage with pink bill, eyes, and feet.

Figure EA-RT-7: Partially leucistic Ruby-throated Hummingbird, with buffy and brown feathers.

Figure EA-RT-8a: Female Ruby-throated Hummingbird with green color marking on throat and upper breast.

Figure EA-RT-8b: Front view of color marked female Ruby-throated Hummingbird. Note very faint gray streaking that is sometimes visible on the female's throat.

Figure EA-RT-9: Adult male Rufous Hummingbird (Selasphorus rufus), with band on right leg. Note overall rusty coloring on back and belly. Viewed from front, gorget is iridescent orange (rather than red of Ruby-throated Hummingbird). This species breeds in western Canada and northwestern U.S. and normally winters in Central Mexico. Female and young male Rufous (Figures 10, 11a, 11b) are far more likely to be seen than adult males in Autumn and Winter in the eastern U.S. (Photo courtesy of Carl Sewell.)

Figure EA-RT-10: Female Rufous Hummingbird. Note rusty sides, rust at base of tail (sometimes hidden), and scattered greenish or metallic-greenish feathers on gorget (Notice band on the bird's right leg.)

Figures EA-RT-11a : First-year male Rufous Hummingbird.

Note streaking on throat, hints of rust especially at base of tail, streaking on throat, and sometimes one or more iridescent orange gorget feathers –not red as in the Ruby-throated Hummingbird. Among Rufous Hummingbirds, females and young males vary considerably in the amount of rust color in their plumage. Many individuals may not look like the ones in the photos above.

EA-RT-11b

All photos © Bill Hilton Jr. & Operation RubyThroat

Teacher Support

Who can do this protocol?

Operation RubyThroat: The Hummingbird Project is open to students in the U.S., Canada, Mexico, and all seven countries of Central America. Please encourage fellow teachers at schools in these states and countries to participate. Home-schooled students, nature centers, Summer camps, senior citizen centers, and other individuals are also welcome to participate in the project.

Site Selection

Hummingbird sightings can be made anywhere in your community, but it is best to select one location and repeat observations at that site. Multiple locations can be established throughout your community. Use the *Hummingbird Site Definition Field Guide* and *Hummingbird Site Definition Data Sheet* to define a unique site definition for each location.

You can create a hummingbird habitat in different ways:

1. A hummingbird feeder can be in the schoolyard, hung outside the classroom window, in a park or other public area, or in someone's yard. It should be easily accessible for frequent visits, proper maintenance, and easy observation.
2. Flowers can be anywhere in your community: in a planted and maintained garden, in a flower box or hanging basket, or in a natural area. Hummingbird flowers come in all colors and shapes, but many of them are red and tubular. The web site for *Operation RubyThroat: The Hummingbird Project* has illustrated lists of ten native and ten exotic hummingbird flowers and hints for cultivating them (see www.rubythroat.org/FoodMain.html).
3. Students may plant and care for a Schoolyard Hummingbird Habitat, or for a garden plot elsewhere in the neighborhood. Master Gardeners or local garden clubs may be interested in assisting with such a project. If you plant a habitat, be sure it can be cared for during summer months. Hints for landscaping for hummingbirds are at www.rubythroat.org/LandscapingMain.html.

Students are encouraged to continue observations during vacations, even if teachers cannot directly supervise them. Students can use their home addresses as reporting stations.

Advance Preparation

Most likely there are bird experts in your community (for example, a local Audubon chapter, Sierra Club group or at a wild bird specialty store). Some of these may be willing to work with students on hummingbird projects, particularly if daily observations are made throughout the Summer. Local bird experts can provide information about the average dates that RTHUs arrive and leave so that students will know approximately when to start looking in earnest.

For US and Canada Schools: If you plan to incorporate hummingbird protocols into your fall curriculum, hang and maintain a hummingbird feeder near your classroom in early August before school begins. Late Summer and Autumn are the busiest time for RTHUs in the U.S. and southern Canada, and having a feeder out before the school year starts will allow your students to conduct up to a month of observations before the RTHUs migrate further south for the Winter.

RTHUs rarely winter in southern Florida and in states along the Gulf of Mexico; a few have been reported elsewhere during Winter in the U.S. In Spring northward migration, most RTHUs apparently depart from Mexico and Central America by mid-March. The earliest birds get to the Gulf Coast states about 1 March and move northward over the next several weeks. There is some indication there may be two waves of RTHU migration into the U.S., one in late March and another up to a month later.

For Mexico and, Central American Schools: Although several factors make identifying and observing RTHUS in Mexico and Central America more difficult than in the U.S. and Canada, students in the tropics actually have opportunities to report Winter RTHU behaviors about which scientists know little or nothing. These students can also

answer questions about when RTHUs arrive from more northern areas in the Autumn migration and depart the tropics during Spring migration. Since Mexico and Central America are home to some hummingbird species that do not migrate, schools in those countries may elect to maintain feeders or nectar-bearing plants to observe general hummingbird behavior on a year-round basis.

In the U.S. and Canada, RTHUs begin their Autumn southward migration as early as the first of August, but no one knows exactly when they begin to show up in Mexico and Central America. Large numbers of hummingbirds are known to assemble along the Gulf Coast in early September. Students in the tropics should begin looking for RTHUs around the end of the first week in August, but it may be that the first arrivals will not appear until a month after that.

In Spring, northward migration, the first adult males RTHUs begin arriving in the Gulf Coast states around the first week in March. Trans-Gulf migrants from Mexico would need to depart just prior to that, since a non-stop flight from the Yucatan Peninsula to the U.S. Gulf Coast takes only about 20 hours. It is not known when RTHUs that overwinter as far south as Panama first begin to move northward, but the first of February seems like a good guess.

Although it appears that many RTHUs fly across the Gulf of Mexico in both Spring and Autumn, it may be that some migrate overland through Mexico. Thus, schools along Mexico's Gulf Coast should look for migrant RTHUs during both migration periods, in the hope of finally answering the question of whether some RTHUs do not cross the Gulf.

Supporting Protocols

Through *Operation RubyThroat: The Hummingbird Project* your students will learn many things about the behavior and ecology of Ruby-throated Hummingbirds (RTHUs). By collecting additional GLOBE data about atmosphere, climate, hydrology, soils, and phenology, your students also may discover new relationships between RTHUs and factors that affect them. As students study RTHUs and other GLOBE protocols, they will undoubtedly ask many questions about these tiny birds and their environment. If they are unable to answer the question through observations or by referring to GLOBE materials or the *Operation RubyThroat* Web site (www.rubythroat.org), you should feel free to contact the project's principal investigator via GLOBEMail or projects@rubythroat.org.

Supporting Activities

Ruby-throated Hummingbirds can be used as a focus for integrated studies of atmosphere, phenology, land cover, botany, animal behavior, geography, and other disciplines. Encourage fellow teachers in all subject areas to participate with you and your students in Operation RubyThroat. For hints on cross-disciplinary activities, see www.rubythroat.org/ActivitiesXDisciplineMain.html. The most successful implementations of *Operation RubyThroat* have been school-wide projects in which every student and teacher was involved in some way.

Have students explore neighborhoods in different seasons around the school. Look for natural and cultivated plots containing hummingbird flowers such as Trumpet Creeper, *Campsis radicans* (see below), a common but important food source throughout much of the RTHU's breeding range. Ask students where they are able to find the most hummingbirds.

Hummingbird observations are also an excellent activity for summer enrichment programs at schools, camps, and nature centers, or for home-schooled students.

Managing Students

Special Measurements of feeder and flower frequency require observations for a continuous block of 45 minutes. Students working in a group can take turns making observations so that no student gets tired or bored.

Management Procedure

Which Hummingbird Protocol To Do

There are several different hummingbird protocols to choose from and the one or more protocols you choose will depend on the amount of time

you have and your educational objectives. Some protocols can be mastered by very young students, while others require more advanced skills and vocabulary. All protocols are designed to help scientists gain a better understanding of RTHU ecology and behavior. Any observations your students make have value, and there is real potential that your students may make an original discovery about RTHUs—especially in Mexico and Central America.

Hummingbird Sighting Protocol: This is easy and requires little or no preparation other than teaching the students how to recognize a hummingbird. After some practice, students will be "looking out" for hummingbirds wherever they go throughout the day whether they are in school or not.

These simple observations are important to estimate the size of local RTHU populations and how these populations change throughout the year. They also help pinpoint when hummingbirds arrive or depart during migration and whether they are just passing through the area in which your school is located. At the beginning or end of the migration period, the only reliable way to know when the last RTHU arrives or departs your area is to make observations every day.

Feeder Visit Protocol: This protocol requires a hummingbird feeder and simple maintenance of it. The feeder food needs to be replenished periodically. The feeder will cause hummingbirds to gather and increase student opportunities to observe and identify different ages and sexes of RTHUs.

In this protocol students count the number of times hummingbirds visit feeders in a 45-minute block and learn how their data may be used to indicate the number of RTHUs in an observation area. Students may notice that an individual RTHU will vigorously defend a feeder and try to drive away other hummingbirds. Students may question the accuracy of their data and conclude that there may be more – or fewer – hummingbirds around than they actually see. Have them write their observations in the comment section of their *Data Sheets*.

Flower Visit Protocol: This protocol allows students to learn about flowers and explore relationships between hummingbird behavior and various food sources in hummingbird habitats. In addition, students can learn about different kinds of flowers and how to maintain them.

If you have to choose between frequency of visits to feeders or flowers, there is probably more to be learned about hummingbirds by observing them feeding on natural food sources, especially native flower species. Ideally, however, your Schoolyard Hummingbird Habitat also will have at least one feeder in it, allowing for both kinds of observations.

Feeder vs. Flower Visit Protocol: This protocol builds on both the *Feeder Visit* and *Flower Visit Protocols* and offers many, many possibilities for interesting student research.

Flower Species Visit Protocol: It is not fully understood why RTHUs choose certain flower species over others, but we do know that some flower species are known to produce nectar at different rates at various times of the day. Students can work closely with scientists to better understand the relationships between feeding behavior and flower species.

Nesting Report Protocol: If your students are fortunate enough to find a hummingbird nest, please encourage them to take observations, but make sure that they do NOT disturb the hummingbirds. Students of any age will be captivated by RTHU nesting behavior and—since many details are not known—scientists will be eager to receive any student data.

Hummingbird Feeder: Care and Maintenance

If hummingbird feeders are used, fill them with a solution of 4 parts water, 1 part sugar; if hummingbirds do not drain a feeder, replace the solution TWICE each week (every third or fourth day) to eliminate mold. See www.rubythroat.org/FeedingHintsMain.html for additional information.

Helpful Hints

- Visit the Web site for *Operation RubyThroat: The Hummingbird Project* on the Web at www.rubythroat.org for more information. Each page has access to an on-line search engine that allows you or your students to type in a key word or phrase. There is also an extensive glossary of hummingbird terms that will be useful as students observe RTHUs and broaden their knowledge of birds and habitats.
- Much hummingbird activity in the U.S. occurs during Summer months when schools are not in session. Nevertheless, data collected in Spring or Autumn (including early arrival and final departure dates) are valuable. U.S. and Canadian students also may be encouraged to continue to collect data during Summer months—even if they are away from home—by using a Summer address as the reporting station. Don't forget that each new location needs a new site definition.
- Although students should try to make observations on a regular basis, we realize that circumstances sometimes interfere. The important thing is for the students to keep accurate records and to make note of when they miss observations for whatever reason.
- Personnel from Hilton Pond Center for Piedmont Natural History may be able to visit your school during the academic year to provide further instruction and possibly to band hummingbirds at your site. A limited number of host schools will be selected from those that submit data to *Operation RubyThroat: The Hummingbird Project* and The GLOBE Program.

Questions for Further Investigation

How do you think storms affect the number of RTHUs you see in your area during Spring? Summer? Autumn?

Does temperature in Spring seem to affect when RTHU nests are built and eggs laid?

Does northward migration of RTHUs in Spring appear to be more closely related to maximum, minimum, or current daily temperatures?

Is there a relationship between Spring arrival of hummingbirds and other phenological events? (See, for example, the GLOBE protocols for green-up, budburst, and lilacs.)

Does the number of RTHUs in your study area change from Spring through Autumn in the U.S. and Canada? Does the number of RTHUs in your study area change as winter progresses in Mexico and Central America? Does the mix of ages and sexes change over that time?

What environmental and ecological factors that are different in Winter make it difficult for RTHUs to stay in areas where they breed?

What can you do to improve chances that RTHUs will be attracted to your school or neighborhood?

What other questions come to mind when you observe RTHU behavior at feeders or in your Schoolyard Hummingbird Habitat?

Selected Reference Books

Howell, Steve N.G. 2002. *Hummingbirds of North America: The Photographic Guide.* AP Natural World, NY.

Johnsgard, P.A. 1997. *The Hummingbirds of North America.* Smithsonian Press, Washington DC.

Newfield, N.L. & B. Nielsen. 1996. *Hummingbird Gardens.* Chapters Publ. Ltd., Shelburne VT.

Sargent, R. 1999. *Ruby-throated Hummingbird.* Stackpole Books, Mechanicsburg PA.

Stokes, D. & L. Stokes. 2002. *Beginner's Guide to Hummingbirds. Little*, Brown, and Co., NY.

Williamson, S.L. 200l. *A Field Guide to Hummingbirds of North America.* Houghton Mifflin, NY.

Frequently Asked Questions

1. I live in the western U.S. where RTHUs don't occur. Can I still participate in *Operation RubyThroat*?

We may be able to make provisions for you to submit data, even though you will be observing different hummingbird species. You'll need to contact projects@rubythroat.org to work out specific protocols.

2. Can you tell if a hummingbird is young or an adult?

In Spring (up to mid-May) all free-flying RTHUs are adults and red-throated males are easily distinguished from white-throated females. As soon as young RTHUs start leaving the nest, ageing and sexing are more difficult because both young females and young males lack red throats. Thus, a white-throated RTHU cannot be aged or sexed reliably in the field after mid-May unless it is a young male that has developed a few red feathers or heavy green or black streaking on its throat (see photos at www.rubythroat.org/RTHUExternalMain.html).

3. Will I ever get a chance to band a hummingbird?

Students at schools near Hilton Pond Center for Piedmont Natural History in York SC may be able to schedule a bird banding field trip to the Center. In addition, Center personnel will visit a limited number of schools in the states and countries where RTHUs occur; on-site hummingbird banding may be a possibility during these visits. Schools must submit data to *Operation RubyThroat: The Hummingbird Project* and The GLOBE Program and apply to the Center to be considered for field trips or in-school visits.

4. What if RTHUs show up in Spring and then disappear?

There may be an early wave of RTHU migrants that stop for a few days at your feeder or garden and then continue flying north. It's also common in Spring even for local hummingbirds to seemingly disappear—especially females that, after mating, spend most of the day sitting on eggs or nestlings.

5. What should I look for in Autumn?

In the U.S. and southern Canada, numbers of RTHUs should increase dramatically in mid-Summer as young birds leave their nests and as early migrants from further north begin to fly back south. By mid-August, students in Mexico and central America should begin looking for the arrival of RTHUs that spent the Summer much further north.

If you have other questions, you may want to visit the Web site for *Operation RubyThroat: The Hummingbird Project* at www.rubythroat.org and type a keyword or phrase into its on-line search engine that appears on each page. The Web site contains extensive information and many photographs. If you still can't find the answer, contact the GLOBE Help Desk or send an e-mail message to projects@rubythroat.org.

Ruby-throated Hummingbird (RTHU)
Site Definition Field Guide

Task
To describe and locate the latitude, longitude, and elevation of a hummingbird site

What You Need
- ❑ *GPS Protocol Field Guide*
- ❑ *GPS Data Sheet*
- ❑ GPS receiver
- ❑ Notebook or clipboard and paper
- ❑ Pencil or pen
- ❑ Compass
- ❑ Calculator *(optional)*
- ❑ Camera
- ❑ *Hummingbird Site Definition Data Sheet*
- ❑ Wildflower identification guide *(optional if only hummingbird feeder is used)*
- ❑ Cultivated flower identification guide *(optional if only hummingbird feeder is used)*

In the Field
1. Complete the top of the *Hummingbird Site Definition Data Sheet* (Recorded By, Measurement Time, Site Name). Identify the latitude, longitude, and elevation following the *GPS Protocol Field Guide*.
2. Record the average latitude, longitude, and elevation from the *GPS Data Sheet* on the *Hummingbird Site Definition Data Sheet.*
3. Indicate if a hummingbird feeder, hummingbird nest, and/or flowers are present at site.
4. When possible, identify and list any species of flowering plants that are present.

   Note: Plant species that are actually producing blooms at any given time may change from Spring through Autumn.
5. Take a photo in each cardinal direction: North, South, East and West. Use your compass to determine the directions.

Ruby-throated Hummingbird (RTHU)

Sighting Protocol Field Guide (U.S. and Canada)

Task

To observe and record one or more of the following:

- Early arrival date of RTHUs in Spring
- Final date RTHUs are observed in Autumn
- RTHU sightings between early arrival and final sighting
- Color-marked or unusual RTHUs, or other species of hummingbirds (vagrants)

What You Need

- ❑ Pencil or pen
- ❑ Bird identification guide
- ❑ Binoculars (optional)
- ❑ *Ruby-throated Hummingbird Sighting Data Sheet*

In the Field

1. Every day about two weeks before the expected arrival of RTHUs, begin looking for RTHUs in your neighborhood and schoolyard. In most U.S. locations, the first RTHUs arrive in March and depart by early October.

   Record observation times even if hummingbirds are not seen.
2. If possible, determine sex (and age) of each RTHU that is observed.
3. Record date of first RTHU Spring sighting—including sex and age (if known)—on the *Hummingbird Sighting Data Sheet*.

   Note: In Spring through mid-May, RTHUs are easily aged and sexed; only adult males have a full red throat and only adult females have white throats.
4. In Spring, Summer, and Autumn, look for RTHUs every day. Record:
   - Each date a red-throated adult male is observed (March through October)
   - Each date an adult female is observed (white throat, March and April only)
   - Each date an undetermined sex is observed (if throat is not observed)
   - Each date an undetermined sex (adult female/young female/young male) is observed (May through October, if throat is unmarked)
   - Each date a young male is observed (May through October, if throat is heavily streaked in green or black and/or has one or more red feathers)
5. After no more RTHUs are seen, record final date of:
   - Adult male (March through November)
   - Undetermined sex (if throat is not observed)
   - Undetermined sex (adult female/young female/young male, if throat is unmarked)
   - Young male (if throat is heavily streaked in green or black and/or has one or more red feathers)
6. In the protocols above, Observation Start Time and Observation End Time may be the same for an individual sighting.

   Note: If you see a color-marked or unusual RTHU, other species of hummingbirds (vagrants), or ANY hummingbird from mid-October through mid-March, describe the color markings and shape of beak. Record your observations on the *Ruby-throated Hummingbird Sighting Data Sheet.* Contact Hilton Pond Center for Piedmont Natural History at research@hiltonpond.org or (803) 684-5852 as soon as possible.

Ruby-throated Hummingbird (RTHU)

Feeder Visit Protocol Field Guide (U.S. and Canada)

Task

To count the number of times RTHUs visit a feeder in 45 minutes

What You Need

- ❑ Hummingbird feeder
- ❑ Food for feeder
- ❑ Pencil or pen
- ❑ Clipboard
- ❑ Binoculars *(optional)*
- ❑ Bird identification guide
- ❑ *Ruby-throated Hummingbird Feeder Visit Data Sheet*

In the Field

1. Fill out the top of the *Ruby-throated Hummingbird Feeder Visit Data Sheet*. Record date and time period that observations are made.
2. For each RTHU seen, identify its sex and age if possible.
3. Record each visit to the feeder on the *Ruby-throated Hummingbird Feeder Visit Data Sheet* during the 45 minutes. Record by the following categories:
   - Red-throated adult male (March through October)
   - Adult female (white-throated, March and April only)
   - Undetermined sex (if throat is not observed)
   - Undetermined sex (adult female/young female/young male, May through October, if throat is unmarked)
   - Young male (if throat is heavily streaked in green or black and/or has one or more red feathers

Note 1: If an individual bird comes to the feeder, departs, and immediately returns to the feeder without perching in the field of view, it counts as only one visit. If it perches within view and returns to the feeder, it still counts as one visit. Only if the bird leaves the field of view and returns can it be counted again, and then it should be counted again even if you think it may be the same bird.

Note 2: If you see a color-marked or unusual RTHU, other species of hummingbirds (vagrants), or ANY hummingbird from mid-October through mid-March, describe the color markings and shape of beak. Record your observations on the *Ruby-throated Hummingbird Sighting Data Sheet.* Contact Hilton Pond Center for Piedmont Natural History at research@hiltonpond.org or (803) 684-5852 as soon as possible.

Ruby-throated Hummingbird (RTHU)

Flower Visit Protocol Field Guide (U.S. and Canada)

Task

To count the number of times RTHUs visit flowers in 45 minutes

What You Need

- ❑ Pencil or pen
- ❑ Clipboard
- ❑ Bird identification guide
- ❑ Schoolyard Hummingbird Habitat, flower garden or wildlife patch
- ❑ Camera (optional)
- ❑ *Ruby-throated Hummingbird Flower Visit Data Sheet*
- ❑ Binoculars (optional)

In the Field

1. Fill out the top of the *Ruby-throated Hummingbird Flower Visit Data Sheet*. Record date and time period that observations are made.
2. For each RTHU seen, identify its sex and age if possible.
3. Record each visit to flowers on the *Ruby-throated Hummingbird Flower Visit Data Sheet* during the 45 minutes. Record by the following categories:
   - Red-throated adult male (March through October)
   - Adult female (white-throated, March and April only)
   - Undetermined sex (if throat is not observed)
   - Undetermined sex (adult female/young female/young male, May through October, if throat is unmarked)
   - Young male (if throat is heavily streaked in green or black and/or has one or more red feathers

Note 1: If an individual bird enters the garden and feeds on several flowers—even different flower species—it counts as only one visit. If a bird perches within view and returns to the flowers, it still counts as one visit. Only if the bird leaves the field of view and returns can it be counted again, and then it should be counted again even if you think it may be the same bird.

Note 2: If you see a color-marked or unusual RTHU, other species of hummingbirds (vagrants), or ANY hummingbird from mid-October through mid-March, describe the color markings and shape of beak. Record your observations on the *Ruby-throated Hummingbird Sighting Data Sheet.* Contact Hilton Pond Center for Piedmont Natural History at research@hiltonpond.org or (803) 684-5852 as soon as possible.

Ruby-throated Hummingbird (RTHU)

Feeder vs. Flower Visit Protocol Field Guide

(U.S. and Canada)

Task

To count and compare the number of times RTHUs visit flowers and feeders in 45 minutes

What You Need

- ❑ Hummingbird feeder
- ❑ Fresh food mixture for hummingbird feeder
- ❑ Pencil or pen
- ❑ Clipboard
- ❑ Bird identification guide
- ❑ Camera
- ❑ Schoolyard Hummingbird Habitat, flower garden, or wildflower patch
- ❑ Binoculars *(optional)*
- ❑ *Ruby-throated Hummingbird Feeder Vs. Flower Visit Data Sheet*

In the Field

1. Fill out the top of the *Ruby-throated Hummingbird Feeder Vs. Flower Visit Data Sheet*. Record date and time period that observations are made.
2. For each RTHU seen, identify its sex and age if possible.
3. Record each visit to the feeder and flowers on the *Ruby-throated Hummingbird Feeder Vs. Flower Visit Data Sheet* during the 45 minutes. Record by the following categories:
   - Red-throated adult male (March through October)
   - Adult female (white-throated, March and April only)
   - Undetermined sex (if throat is not observed)
   - Undetermined sex (adult female/young female/young male, May through October, if throat is unmarked)
   - Young male (if throat is heavily streaked in green or black and/or has one or more red feathers

Note 1: If an individual bird enters the garden and feeds on a flower, then at a feeder, then on a flower, it counts as two flower visits and one feeder visit. Every separate visit to a flower or feeder is counted. If a bird feeds on the same flower or flower stalk several times in succession, it counts as only one flower visit. If a bird feeds on Flower A, then on Flower B, and again on Flower A, it counts as three visits. This procedure is different from the observations made when you are looking only at feeder visits or only at flower visits.

Note 2: If you see a color-marked or unusual RTHU, other species of hummingbirds (vagrants), or ANY hummingbird from mid-October through mid-March, describe the color markings and shape of beak. Record your observations on the *Ruby-throated Hummingbird Sighting Data Sheet.* Contact Hilton Pond Center for Piedmont Natural History at research@hiltonpond.org or (803) 684-5852 as soon as possible.

Ruby-throated Hummingbird (RTHU)

Flower Species Visit Protocol Field Guide (U.S. and Canada)

Task

To count the number of times RTHUs visit different flower species during 45 minutes. Observations may be continued during consecutive and/or subsequent hours to see if hummingbird flower selection changes throughout the day.)

What You Need

- ❑ Pencil or pen
- ❑ Clipboard
- ❑ Bird identification guide
- ❑ *Ruby-throated Hummingbird Flower Species Visit Data Sheet*
- ❑ Binoculars *(optional)*
- ❑ Local wildflower and cultivated flower identification guides
- ❑ Camera *(optional)*

In the Field

1. Fill out the top of the *Ruby-throated Hummingbird Flower Species Visit Data Sheet*. Record date and time period when observations are made.
2. Identify the different flower species. Record flower species on the *Ruby-throated Hummingbird Flower Species Visit Data Sheet*. If you are unable to identify the flower to species, at least take it to genus level.
3. Take a close-up photograph of any flower species that is visited by a hummingbird at your study site. Submit following the instructions in the *Implementation Guide*. This will allow verification of the identification to species.
4. For each RTHU seen during the 45 minutes, identify its sex and age if possible.
5. For each flower species, record by the following categories:
   - Red-throated adult male (March through October)
   - Adult female (white-throated, March and April only)
   - Undetermined sex (if throat is not observed)
   - Undetermined sex (adult female/young female/young male, May through October, if throat is unmarked)
   - Young male (if throat is heavily streaked in green or black and/or has one or more red feathers

Note 1: If an individual bird enters the garden and feeds on several flowers, it counts as only one visit; if it perches within view and returns to the flowers, it still counts as one visit; only if the bird leaves the field of view and returns can it be counted again, and then it should be counted again even if you think it may be the same bird.

Note 2: If you see a color-marked or unusual RTHU, other species of hummingbirds (vagrants), or ANY hummingbird from mid-October through mid-March, describe the color markings and shape of beak. Record your observations on the *Ruby-throated Hummingbird Sighting Data Sheet*. Contact Hilton Pond Center for Piedmont Natural History at research@hiltonpond.org or (803) 684-5852 as soon as possible.

Ruby-throated Hummingbird (RTHU)

Nesting Report Protocol Field Guide (U.S. and Canada)

Task

To observe and report nesting behavior of RTHUs

What You Need

- ❑ Pencil or pen
- ❑ Clipboard
- ❑ Bird identification guide
- ❑ *Ruby-throated Hummingbird Nesting Data Sheet*
- ❑ Binoculars *(optional)*
- ❑ Camera

In the Field

1. Fill out the top of the *Ruby-throated Hummingbird Nesting Data Sheet*. Record when the nest was found.
2. Record the dates for what you can of the following observations. **Do not disturb the nest.**
   - Start of nest construction
   - End of nest construction
   - Laying of first egg
   - Laying of second egg
   - First sighting of adult female sitting on nest
   - Hatching date(s) for egg(s)
   - First sighting of young hummingbirds (nestlings) in nest
   - Fledging date (when nestlings leave the nest)
   - Last sighting of adult female on nest
3. Record if the eggs do not hatch or if the nestlings die. If the female rebuilds the nest or reuses the nest for a new set of eggs, fill out a second data sheet and record the new observations as listed above.
4. Record dates and observations of any adult male behavior at the nest. Be careful to report observations of what you actually see, rather than an interpretation of what you see.

Examples: 2 April 2002—Male sitting on nest for 30 seconds (NOT male incubating eggs)
1 May 2002—Male flying over nest (NOT male protecting nest)

Note 1: It is against state or federal law to possess the body, feathers, skeleton, nest or eggs of any wild free-flying bird—including hummingbirds—unless you have a special permit.

Note 2: If you see a color-marked or unusual RTHU, other species of hummingbirds (vagrants), or ANY hummingbird from mid-October through mid-March, describe the color markings and shape of beak. Record your observations on the *Ruby-throated Hummingbird Sighting Data Sheet.* Contact Hilton Pond Center for Piedmont Natural History at research@hiltonpond.org or (803) 684-5852 as soon as possible.

Ruby-throated Hummingbird (RTHU)

Sighting Protocol Field Guide

(for Mexico, Central America, and Caribbean)

Task

To observe and record one or more of the following:

- Early arrival date of RTHUs in Autumn
- Final date RTHUs are observed in Spring
- RTHU presence between early arrival and final sighting
- RTHUs that are color-marked or with unusual plumage

What You Need

- ❑ Pencil or pen
- ❑ Bird identification guide
- ❑ *Ruby-throated Hummingbird Sighting Data Sheet*
- ❑ Binoculars *(optional)*

In the Field

1. Every day about two weeks before the expected arrival of RTHUs, begin looking for RTHUs in your neighborhood and schoolyard. In Mexico, the first RTHUs probably arrive in early to-mid August and begin departing by late February or early March. Precise early arrival and final departure dates for Mexico, Central America, and the Caribbean are not known, so please be alert for RTHUs from August through April, perhaps even through mid-May. *Record observation times even if hummingbirds are not seen.*
2. If possible, determine sex and age of each RTHU that is observed.
3. Record date of first RTHU Autumn sighting—including sex and age (if known)—on the *Hummingbird Sighting Data Sheet*. **Note:** January through mid-May, RTHUs are easily aged and sexed; only adult males have full red throats and only females have completely white throats; a few males that hatched very late the preceding summer may have incomplete red throats.
4. In Autumn, Winter, and Spring, look for RTHUs every day. Record:
   - Each date a red-throated adult male is observed
   - Each date an adult female is observed (white throat, January through mid-May only)
   - Each date an undetermined sex is observed (if throat is not observed)
   - Each date an undetermined sex (possible adult female/young female/young male) is observed (August through December, if throat is unmarked)
   - Each date a young male is observed (August through December, and perhaps later, if throat is heavily streaked in green or black and/or has one or more red feathers)
5. After no more RTHUs are seen, record final date of:
   - Adult male
   - Undetermined sex (if throat is not observed)
   - Undetermined sex (possible adult female/young female/young male, through December, if throat is unmarked)

- Young male (if throat is heavily streaked in green or black and/or has one or more red feathers)

6. In the protocols above, Observation Start Time and Observation End Time may be the same for an individual sighting.

Note: If you see a color-marked RTHU, describe the color markings and attempt to observe whether the bird is banded and on which leg. If you see a RTHU with unusual colors (albinism, leucism, etc.) make note of the colors and patterns and get a photo if possible. Record your observations on the *Ruby-throated Hummingbird Sighting Data Sheet*. Contact Hilton Pond Center for Piedmont Natural History at research@hiltonpond.org or (803) 684-5852 as soon as possible.

Ruby-throated Hummingbird (RTHU)

Feeder Visit Protocol Field Guide

(for Mexico, Central America, and Caribbean)

Task

To count the number of times RTHUs visit a feeder in 45 minutes

What You Need

- ❑ Hummingbird feeder
- ❑ Food for feeder (fresh sugar water mix)
- ❑ Pencil or pen
- ❑ Clipboard
- ❑ Bird identification guide
- ❑ *Ruby-throated Hummingbird Feeder Visit Data Sheet*
- ❑ Binoculars *(optional)*

In the Field

1. Fill out the top of the *Ruby-throated Hummingbird Feeder Visit Data Sheet*. Record date and time period that observations are made.
2. For each RTHU seen, identify its sex and age if possible.
3. Record each visit to the feeder on the *Ruby-throated Hummingbird Feeder Visit Data Sheet* during the 45 minutes. Record by the following categories:
   - Red-throated adult male
   - Adult female (white-throated, January through April only)
   - Undetermined sex (if throat is not observed)
   - Undetermined sex (possible adult female/young female/young male, August through December, if throat is unmarked)
   - Young male (if throat is heavily streaked in green or black and/or has one or more red feathers; nearly all develop a full red throat sometime before departing north in spring)

Note 1: If an individual bird comes to the feeder, departs, and immediately returns to the feeder without perching in the field of view, it counts as only one visit. If it perches within view and returns to the feeder, it still counts as one visit. Only if the bird leaves the field of view and returns can it be counted again, and then it should be counted again even if you think it may be the same bird.

Note 2: If you see a color-marked RTHU, describe the color markings and attempt to observe whether the bird is banded and on which leg. If you see a RTHU with unusual colors (albinism, leucism, etc.) make note of the colors and patterns and get a photo if possible. Record your observations on the *Ruby-throated Hummingbird Sighting Data Sheet*. Contact Hilton Pond Center for Piedmont Natural History at research@hiltonpond.org or (803) 684-5852 as soon as possible.

Ruby-throated Hummingbird (RTHU)

Flower Visit Protocol Field Guide

(for Mexico, Central America, and Caribbean)

Task

To count the number of times RTHUs visit flowers in 45 minutes

What You Need

- ❑ Pencil or pen
- ❑ Clipboard
- ❑ Bird identification guide
- ❑ Schoolyard Hummingbird Habitat, flower garden, or wildflower patch
- ❑ *Ruby-throated Hummingbird Flower Visit Data Sheet*
- ❑ Camera *(optional)*
- ❑ Binoculars *(optional)*

In the Field

1. Fill out the top of the *Ruby-throated Hummingbird Flower Visit Data Sheet*. Record date and time period that observations are made.
2. For each RTHU seen, identify its sex and age if possible.
3. Record each visit to flowers on the *Ruby-throated Hummingbird Flower Visit Data Sheet* during the 45 minutes. Record by the following categories:
   - Red-throated adult male
   - Adult female (white-throated, January through April only)
   - Undetermined sex (if throat is not observed)
   - Undetermined sex (possible adult female/young female/young male, August through December, if throat is unmarked)
   - Young male (if throat is heavily streaked in green or black and/or has one or more red feathers; nearly all develop a full red throat sometime before departing north in spring)

Note 1: If an individual bird enters the garden and feeds on several flowers—even different flower species—it counts as only one visit. If a bird perches within view and returns to the flowers, it still counts as one visit. Only if the bird leaves the field of view and returns can it be counted again, and then it should be counted again even if you think it may be the same bird.

Note 2: If you see a color-marked RTHU, describe the color markings and attempt to observe whether the bird is banded and on which leg. If you see a RTHU with unusual colors (albinism, leucism, etc.) make note of the colors and patterns and get a photo if possible. Record your observations on the *Ruby-throated Hummingbird Sighting Data Sheet*. Contact Hilton Pond Center for Piedmont Natural History at research@hiltonpond.org or (803) 684-5852 as soon as possible.

Ruby-throated Hummingbird (RTHU)

Feeder vs. Flower Visit Protocol Field Guide

(for Mexico, Central America, and Caribbean)

Task

To count and compare the number of times RTHUs visit flowers and feeders in 45 minutes

What You Need

- ❑ Hummingbird feeder
- ❑ Food for feeder (fresh sugar water mix)
- ❑ Pencil or pen
- ❑ Clipboard
- ❑ Bird identification guide
- ❑ Schoolyard Hummingbird Habitat, flower garden, or wildflower patch
- ❑ *Ruby-throated Hummingbird Feeder Vs. Flower Visit Data Sheet*
- ❑ Camera (optional)
- ❑ Binoculars (optional)

In the Field

1. Fill out the top of the *Ruby-throated Hummingbird Feeder Vs. Flower Visit Data Sheet*. Record date and time period that observations are made.
2. For each RTHU seen, identify its sex and age if possible.
3. Record each visit to the feeder and flowers on the *Ruby-throated Hummingbird Feeder Vs. Flower Visit Data Sheet* during the 45 minutes. Record by the following categories:
   - Red-throated adult male
   - Adult female (white-throated, January through April only)
   - Undetermined sex (if throat is not observed)
   - Undetermined sex (possible adult female/young female/young male, August through December, if throat is unmarked)
   - Young male (if throat is heavily streaked in green or black and/or has one or more red feathers; nearly all develop a full red throat sometime before departing north in spring)

Note 1: If an individual bird enters the garden and feeds on a flower, then at a feeder, then on a flower, it counts as two flower visits and one feeder visit. Every separate visit to a flower or feeder is counted. If a bird feeds on the same flower or flower stalk several times in succession, it counts as only one flower visit. If a bird feeds on Flower A, then on Flower B, and again on Flower A, it counts as three visits. This procedure is different from the observations made when you are looking only at feeder visits or only at flower visits.

Note 2: If you see a color-marked RTHU, describe the color markings and attempt to observe whether the bird is banded and on which leg. If you see a RTHU with unusual colors (albinism, leucism, etc.) make note of the colors and patterns and get a photo if possible. Record your observations on the *Ruby-throated Hummingbird Sighting Data Sheet*. Contact Hilton Pond Center for Piedmont Natural History at research@hiltonpond.org or (803) 684-5852 as soon as possible.

Ruby-throated Hummingbird (RTHU)

Flower Species Visit Protocol Field Guide

(for Mexico, Central America, and Caribbean)

Task

To count the number of times RTHUs visit different flower species during 45 minutes. Observations may be continued during consecutive and/or subsequent hours to see if hummingbird flower selection changes throughout the day.)

What You Need

- ❑ Pencil or pen
- ❑ Clipboard
- ❑ Bird identification guide
- ❑ Local wildflower and cultivated flower identification guides
- ❑ Schoolyard Hummingbird Habitat, flower garden, or wildflower patch
- ❑ *Ruby-throated Hummingbird Flower Species Visit Data Sheet*
- ❑ Camera *(optional)*
- ❑ Binoculars *(optional)*

In the Field

1. Fill out the top of the *Ruby-throated Hummingbird Flower Species Visit Data Sheet*. Record date and time period when observations are made.
2. Identify the different flower species at site. Record flower species on the *Ruby-throated Hummingbird Flower Species Visit Data Sheet*. If you are unable to identify the flower to species, at least take it to genus level.
3. Submit a close-up photograph of any flower species that is visited by a hummingbird on your study site. This will allow verification of the identification to species.
4. For each RTHU seen during the 45 minutes, identify its sex and age if possible.
5. For each flower species, record by the following categories:
   - Red-throated adult male
   - Adult female (white-throated, January through April only)
   - Undetermined sex (if throat is not observed)
   - Undetermined sex (possible adult female/young female/young male, August through December, if throat is white)
   - Young male (if throat is heavily streaked in green or black and/or has one or more red feathers; nearly all develop a full red throat sometime before departing north in spring)

Note 1: If an individual bird enters the garden and feeds on several flowers, it counts as only one visit; if it perches within view and returns to the flowers, it still counts as one visit; only if the bird leaves the field of view and returns can it be counted again, and then it should be counted again even if you think it may be the same bird.

Note 2: If you see a color-marked RTHU, describe the color markings and attempt to observe whether the bird is banded and on which leg. If you see a RTHU with unusual colors (albinism, leucism, etc.) make note of the colors and patterns and get a photo if possible. Record your observations on the *Ruby-throated Hummingbird Sighting Data Sheet.* Contact Hilton Pond Center for Piedmont Natural History at research@hiltonpond.org or (803) 684-5852 as soon as possible.